Virtual reality can support and enhance outdoor environmental education

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Credit: Eren Li from Pexels

The use of virtual reality (VR) and augmented reality (AR) for environmental education is controversial. Some are concerned that these technologies might replace or disrupt outdoor experiences that can

connect students to nature and develop pro-environmental behaviors.

However, learning through technology and being outdoors aren't mutually exclusive. When VR and AR are used effectively they can support and enhance environmental education while contributing to students' positive well-being.

Access and connection to nature

Many nature locations are inaccessible to students due to distance, safety concerns, economic barriers or ability.

Access to ecologically sensitive areas like coral reefs or wetlands is limited in order to preserve them. VR can provide an alternative way to experience these locations.

Virtual technologies can also promote outdoor trips close to home and help students connect with global and local environmental issues. For example, research by virtual reality design expert Ana-Despina Tudor, with colleagues, used a 360-degree field trip of the Borneo rainforest to teach students about deforestation. Lessons were then applied to a local nature reserve being affected by railroad construction. Students worked with a local charity to help protect it.

Multiple points of view

Such research holds promise for those seeking to extend the connection between a sense of place and pro-environmental behavior to regional, continental and global scales.

That means adopting eco-friendly attitudes that can minimize adverse effects on the natural environment wherever these effects occur.

"Wicked" or complex environmental problems require students to engage with multiple places and points of view. Improved access through virtual simulations may promote empathy and overcome inaction brought on by the psychological distance that students might feel towards nature hit hardest by climate change.

Making the invisible visible

VR and AR lose much of their potential when they are only used to simulate outdoor environments. Instead, these technologies become transformative when students can experience environmental processes that would otherwise be invisible to them due to their scale or the timeframes over which changes occur.

Consider a virtual reality simulation known as the Stanford Ocean Acidification Experience. During this simulation, students experience the effects of a century's worth of ocean acidification on reef biodiversity by moving "amid coral as it loses its vitality" and observing how increasingly acidic water affects marine life.

When researchers measured the effect of this simulation by comparing student test scores, they found that knowledge of ocean acidification increased by almost 150% and was retained after several weeks.

Combining information sources

AR can be effective at combining different multimedia and information sources about environmental processes. Harvard researchers developed the AR tool EcoMOBILE to help middle-school students monitor water quality.

Students can play an augmented reality game designed to to engage

students in learning about water ecosystems on a smartphone while being outdoors monitoring water.

The program resulted in high levels of engagement, and significant gains to understanding and problem-solving.

Critical environmental education

Compared to traditional modes of outdoor education, VR and AR can provide opportunities to include diverse knowledges.

Practitioners of critical approaches to environmental education may take this opportunity to engage with stories produced by marginalized communities about their experiences of nature and climate change.

Teachers can then engage students in self-reflection while highlighting broader issues surrounding social and environmental justice.

Engaging Indigenous knowledges

Camosun Bog 360 is a virtual tour of a local wetland in Vancouver, and is one example of this approach.

Community interviews with volunteers who are engaged in bog restoration, and videos produced by the Musqueam First Nation are embedded and linked throughout the field trip. This content is also available to students in-person using QR codes and their smartphones.

One of the authors of this story, Micheal, developed related resources in partnership with the Pacific Spirit Park Society and Camosun Bog Restoration Group to use in educational settings.

The goal of the field trip is to introduce students to creatures and plants, help them reflect on colonial histories of Camosun Bog, and encourage them to protect the bog through volunteerism.

However, care must be taken. As Métis/otipemisiw anthropologist Zoe Todd explains, Indigenous knowledges are too often filtered through white intermediaries. At stake is that Indigenous voices can be lost or distorted. It is vitally important that Indigenous people tell their own stories.

In the case of Camosun Bog 360, the Musqueam Teaching Kit provides guidance to the researcher. This kit, developed by the Musqueam First Nation, encourages students and teachers to learn about their culture, language and histories. It provides links, videos and other teaching materials for sharing with students.

Building environmental stewards

Those who are skeptical of whether VR and AR can support in-person outdoor education should consider the important role these technologies play in equipping students to navigate challenges today.

Indeed, skills like digital literacy, creative thinking, communication, collaboration and problem solving are more essential than ever as students transition to the professional world.

VR and AR can enable students to participate in solving complex environmental problems, present and future. A drawback is the rapid advancements in hardware, software and implementation: Schools can already be slow at implementing new technologies, due to both the time it takes to train instructors as well as economic and administrative barriers, and assessing how long an investment may seem worthwhile may be a consideration.

The environmental stewards of tomorrow will need to adapt to the new tools researchers and professionals are using to understand, address and communicate wicked environmental problems. Without appropriate training and practice using these technologies, students could be put at a disadvantage as they enter higher education and the workforce.

Educators have a role in empowering students as stewards, such as finding new ways to include emerging technologies in environmental education.

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